White or almost white, crystalline powder or crystals, freely soluble in water and in ethanol (96 per cent).

Assay. Dissolve 0.600 g in a mixture of 5 mL of *nitric acid R* and 50 mL of *water R*. Add 50.0 mL of *0.1 M silver nitrate* and 3 mL of *dibutyl phthalate R* and shake. Using 2 mL of *ferric ammonium sulfate solution R2* as indicator, titrate with *0.1 M ammonium thiocyanate* until a reddish-yellow colour is obtained.

1 mL of *0.1 M silver nitrate* is equivalent to 16.11 mg of $ZrCl_2O,8H_2O$.

Zirconyl nitrate. A basic salt corresponding approximately to the formula $ZrO(NO_3)_2,2H_2O$. *1097200.* [14985-18-3].

A white or almost white powder or crystals, hygroscopic, soluble in water. The aqueous solution is a clear or at most slightly opalescent liquid.

Storage: in an airtight container.

Zirconyl nitrate solution. *1097201.*

A 1 g/L solution in a mixture of 40 mL of *water R* and 60 mL of *hydrochloric acid R*.

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4.1.2. STANDARD SOLUTIONS FOR LIMIT TESTS

Acetaldehyde standard solution (100 ppm C_2H_4O). *5000100.*

Dissolve 1.0 g of *acetaldehyde R* in *2-propanol R* and dilute to 100.0 mL with the same solvent. Dilute 5.0 mL of the solution to 500.0 mL with *2-propanol R*. Prepare immediately before use.

Acetaldehyde standard solution (100 ppm C_2H_4O) R1. *5000101.*

Dissolve 1.0 g of *acetaldehyde R* in *water R* and dilute to 100.0 mL with the same solvent. Dilute 5.0 mL of the solution to 500.0 mL with *water R*. Prepare immediately before use.

Aluminium standard solution (200 ppm Al). *5000200.*

Dissolve in *water R* a quantity of *aluminium potassium sulfate R* equivalent to 0.352 g of $AlK(SO_4)_2,12H_2O$. Add 10 mL of *dilute sulfuric acid R* and dilute to 100.0 mL with *water R*.

Aluminium standard solution (100 ppm Al). *5000203.*

Immediately before use, dilute with *water R* to 10 times its volume a solution containing 8.947 g of *aluminium chloride R* in 1000.0 mL of *water R*.

Aluminium standard solution (10 ppm Al). *5000201.*

Immediately before use, dilute with *water R* to 100 times its volume in a solution containing *aluminium nitrate R* equivalent to 1.39 g of $Al(NO_3)_3,9H_2O$ in 100.0 mL.

Aluminium standard solution (2 ppm Al). *5000202.*

Immediately before use, dilute with *water R* to 100 times its volume a solution containing *aluminium potassium sulfate R* equivalent to 0.352 g of $AlK(SO_4)_2,12H_2O$ and 10 mL of *dilute sulfuric acid R* in 100.0 mL.

Ammonium standard solution (100 ppm NH_4). *5000300.*

Immediately before use, dilute to 25 mL with *water R* 10 mL of a solution containing *ammonium chloride R* equivalent to 0.741 g of NH_4Cl in 1000 mL.

Ammonium standard solution (3 ppm NH_4). *5006100.*

Immediately before use, dilute with *water R* to 100 times its volume a solution containing *ammonium chloride R* equivalent to 0.889 g of NH_4Cl in 1000.0 mL.

Ammonium standard solution (2.5 ppm NH_4). *5000301.*

Immediately before use, dilute with *water R* to 100 times its volume a solution containing *ammonium chloride R* equivalent to 0.741 g of NH_4Cl in 1000.0 mL.

Ammonium standard solution (1 ppm NH_4). *5000302.*

Immediately before use, dilute *ammonium standard solution (2.5 ppm NH_4) R* to 2.5 times its volume with *water R*.

Antimony standard solution (100 ppm Sb). *5000401.*

Dissolve *antimony potassium tartrate R* equivalent to 0.274 g of $C_4H_4KO_7\,Sb,{}^1/_2H_2O$ in 500 mL of *1M hydrochloric acid* and dilute the clear solution to 1000 mL with *water R*.

Antimony standard solution (1 ppm Sb). *5000400.*

Dissolve *antimony potassium tartrate R* equivalent to 0.274 g of $C_4H_4KO_7Sb,{}^1/_2H_2O$ in 20 mL of *hydrochloric acid R1* and dilute the clear solution to 100.0 mL with *water R*. To 10.0 mL of this solution add 200 mL of *hydrochloric acid R1* and dilute to 1000.0 mL with *water R*. To 100.0 mL of this solution add 300 mL of *hydrochloric acid R1* and dilute to 1000.0 mL with *water R*. Prepare the dilute solutions immediately before use.

Arsenic standard solution (10 ppm As). *5000500.*

Immediately before use, dilute with *water R* to 100 times its volume a solution prepared by dissolving *arsenious trioxide R* equivalent to 0.330 g of As_2O_3 in 5 mL of *dilute sodium hydroxide solution R* and diluting to 250.0 mL with *water R*.

Arsenic standard solution (1 ppm As). *5000501.*

Immediately before use, dilute *arsenic standard solution (10 ppm As) R* to 10 times its volume with *water R*.

Arsenic standard solution (0.1 ppm As). *5000502.*

Immediately before use, dilute *arsenic standard solution (1 ppm As) R* to 10 times its volume with *water R*.

Barium standard solution (0.1 per cent Ba). *5000601.*

Dissolve *barium chloride R* equivalent to 0.178 g of $BaCl_2,2H_2O$ in *distilled water R* and dilute to 100.0 mL with the same solvent.

Barium standard solution (50 ppm Ba). *5000600.*

Immediately before use, dilute with *distilled water R* to 20 times its volume a solution in *distilled water R* containing *barium chloride R* equivalent to 0.178 g of $BaCl_2,2H_2O$ in 100.0 mL.

Barium standard solution (2 ppm Ba). *5005600.*

Immediately before use, dilute *barium standard solution (50 ppm Ba) R* to 25 times its volume with *distilled water R*.

Bismuth standard solution (100 ppm Bi). *5005300.*

Dissolve *bismuth R* equivalent to 0.500 g of Bi in 50 mL of *nitric acid R* and dilute to 500.0 mL with *water R*. Dilute the solution to 10 times its volume with *dilute nitric acid R* immediately before use.

Cadmium standard solution (0.1 per cent Cd). *5000700.*

Dissolve *cadmium R* equivalent to 0.100 g of Cd in the smallest necessary amount of a mixture of equal volumes of *hydrochloric acid R* and *water R* and dilute to 100.0 mL with a 1 per cent *V/V* solution of *hydrochloric acid R*.

Cadmium standard solution (10 ppm Cd) . *5000701.*

Immediately before use, dilute *cadmium standard solution (0.1 per cent Cd) R* to 100 times its volume with a 1 per cent *V/V* solution of *hydrochloric acid R*.

Calcium standard solution (400 ppm Ca). *5000800.*

Immediately before use, dilute with *distilled water R* to 10 times its volume a solution in *distilled water R* containing *calcium carbonate R* equivalent to 1.000 g of $CaCO_3$ and 23 mL of *1 M hydrochloric acid* in 100.0 mL.

Calcium standard solution (100 ppm Ca). *5000801.*

Immediately before use, dilute with *distilled water R* to 10 times its volume a solution in *distilled water R* containing *calcium carbonate R* equivalent to 0.624 g of $CaCO_3$ and 3 mL of *acetic acid R* in 250.0 mL.

Calcium standard solution (100 ppm Ca) R1. *5000804.*
Immediately before use, dilute with *water R* to 10 times its volume a solution containing *anhydrous calcium chloride R* equivalent to 2.769 g of $CaCl_2$ in 1000.0 mL of *dilute hydrochloric acid R*.

Calcium standard solution (100 ppm Ca), alcoholic. *5000802.*
Immediately before use, dilute with *ethanol (96 per cent) R* to 10 times its volume a solution in *distilled water R* containing *calcium carbonate R* equivalent to 2.50 g of $CaCO_3$ and 12 mL of *acetic acid R* in 1000.0 mL.

Calcium standard solution (10 ppm Ca). *5000803.*
Immediately before use, dilute with *distilled water R* to 100 times its volume a solution in *distilled water R* containing *calcium carbonate R* equivalent to 0.624 g of $CaCO_3$ and 3 mL of *acetic acid R* in 250.0 mL.

Chloride standard solution (50 ppm Cl). *5004100.*
Immediately before use, dilute with *water R* to 10 times its volume a solution containing *sodium chloride R* equivalent to 0.824 g of NaCl in 1000.0 mL.

Chloride standard solution (8 ppm Cl). *5000900.*
Immediately before use, dilute with *water R* to 100 times its volume a solution containing *sodium chloride R* equivalent to 1.32 g of NaCl in 1000.0 mL.

Chloride standard solution (5 ppm Cl). *5000901.*
Immediately before use, dilute with *water R* to 100 times its volume a solution containing *sodium chloride R* equivalent to 0.824 g of NaCl in 1000.0 mL.

Chromium liposoluble standard solution (1000 ppm Cr). *5004600.*
A chromium (metal) organic compound in an oil.

Chromium standard solution (0.1 per cent Cr). *5001002.*
Dissolve *potassium dichromate R* equivalent to 2.83 g of $K_2Cr_2O_7$ in *water R* and dilute to 1000.0 mL with the same solvent.

Chromium standard solution (100 ppm Cr). *5001000.*
Dissolve *potassium dichromate R* equivalent to 0.283 g of $K_2Cr_2O_7$ in *water R* and dilute to 1000.0 mL with the same solvent.

Chromium standard solution (0.1 ppm Cr). *5001001.*
Immediately before use, dilute *chromium standard solution (100 ppm Cr) R* to 1000 times its volume with *water R*.

Cobalt standard solution (100 ppm Co). *5004300.*
Dissolve *cobalt nitrate R* equivalent to 0.494 g of $Co(NO_3)_2,6H_2O$ in 500 mL of *1M nitric acid* and dilute the clear solution to 1000 mL with *water R*.

Copper liposoluble standard solution (1000 ppm Cu). *5004700.*
A copper (metal) organic compound in an oil.

Copper standard solution (0.1 per cent Cu). *5001100.*
Dissolve *copper sulfate R* equivalent to 0.393 g of $CuSO_4,5H_2O$ in *water R* and dilute to 100.0 mL with the same solvent.

Copper standard solution (10 ppm Cu). *5001101.*
Immediately before use, dilute *copper standard solution (0.1 per cent Cu) R* to 100 times its volume with *water R*.

Copper standard solution (0.1 ppm Cu). *5001102.*
Immediately before use, dilute *copper standard solution (10 ppm Cu) R* to 100 times its volume with *water R*.

Ferrocyanide standard solution (100 ppm $Fe(CN)_6$). *5001200.*
Immediately before use, dilute with *water R* to 10 times its volume a solution containing *potassium ferrocyanide R* equivalent to 0.20 g of $K_4Fe(CN)_6,3H_2O$ in 100.0 mL.

Ferricyanide standard solution (50 ppm $Fe(CN)_6$). *5001300.*
Immediately before use, dilute with *water R* to 100 times its volume a solution containing *potassium ferricyanide R* equivalent to 0.78 g of $K_3Fe(CN)_6$ in 100.0 mL.

Fluoride standard solution (10 ppm F). *5001400.*
Dissolve in *water R sodium fluoride R* previously dried at 300 °C for 12 h, equivalent to 0.442 g of NaF, and dilute to 1000.0 mL with the same solvent (1 mL = 0.2 mg F). Store in a polyethylene container. Immediately before use, dilute the solution to 20 times its volume with *water R*.

Fluoride standard solution (1 ppm F). *5001401.*
Immediately before use, dilute *fluoride standard solution (10 ppm F) R* to 10 times its volume with *water R*.

Formaldehyde standard solution (5 ppm CH_2O). *5001500.*
Immediately before use, dilute with *water R* to 200 times its volume a solution containing 1.0 g of CH_2O per litre prepared from *formaldehyde solution R*.

Germanium standard solution (100 ppm Ge). *5004400.*
Dissolve *ammonium hexafluorogermanate(IV) R* equivalent to 0.307 g of $(NH_4)_2GeF_6$ in a 0.01 per cent *V/V* solution of *hydrofluoric acid R*. Dilute the clear solution to 1000 mL with *water R*.

Glyoxal standard solution (20 ppm $C_2H_2O_2$). *5003700.*
In a 100 mL graduated flask weigh a quantity of *glyoxal solution R* corresponding to 0.200 g of $C_2H_2O_2$ and make up to volume with *anhydrous ethanol R*. Immediately before use dilute the solution to 100 times its volume with the same solvent.

Glyoxal standard solution (2 ppm $C_2H_2O_2$). *5003701.*
Immediately before use, dilute *glyoxal standard solution (20 ppm $C_2H_2O_2$) R* to 10 times its volume with *anhydrous ethanol R*.

Hydrogen peroxide standard solution (10 ppm H_2O_2). *5005200.*
Dilute 10.0 mL of *dilute hydrogen peroxide solution R* to 300.0 mL with *water R*. Dilute 10.0 mL of this solution to 1000.0 mL with *water R*. Prepare immediately before use.

Iodide standard solution (10 ppm I). *5003800.*
Immediately before use, dilute with *water R* to 100 times its volume a solution containing *potassium iodide R* equivalent to 0.131 g of KI in 100.0 mL.

Iron standard solution (0.1 per cent Fe). *5001605.*
Dissolve 0.100 g of Fe in the smallest amount necessary of a mixture of equal volumes of *hydrochloric acid R* and *water R* and dilute to 100.0 mL with *water R*.

Iron standard solution (250 ppm Fe). *5001606.*
Immediately before use, dilute with *water R* to 40 times its volume a solution containing 4.840 g of *ferric chloride R* in a 150 g/L solution of *hydrochloric acid R* diluted to 100.0 mL.

Iron standard solution (20 ppm Fe). *5001600.*
Immediately before use, dilute with *water R* to 10 times its volume a solution containing *ferric ammonium sulfate R* equivalent to 0.863 g of $FeNH_4(SO_4)_2,12H_2O$ and 25 mL of *dilute sulfuric acid R* in 500.0 mL.

Iron standard solution (10 ppm Fe). *5001601.*
Immediately before use, dilute with *water R* to 100 times its volume a solution containing *ferrous ammonium sulfate R* equivalent to 7.022 g of $Fe(NH_4)_2(SO_4)_2,6H_2O$ and 25 mL of *dilute sulfuric acid R* in 1000.0 mL.

Iron standard solution (8 ppm Fe). *5001602.*
Immediately before use, dilute with *water R* to 10 times its volume a solution containing 80 mg of *iron R* and 50 mL of *hydrochloric acid R* (220 g/L HCl) in 1000.0 mL.

Iron standard solution (2 ppm Fe). *5001603.*

Immediately before use, dilute *iron standard solution (20 ppm Fe) R* to 10 times its volume with *water R*.

Iron standard solution (1 ppm Fe). *5001604.*

Immediately before use, dilute *iron standard solution (20 ppm Fe) R* to 20 times its volume with *water R*.

Lead liposoluble standard solution (1000 ppm Pb). *5004800.*

A lead (metal) organic compound in an oil.

Lead standard solution (0.1 per cent Pb). *5001700.*

Dissolve *lead nitrate R* equivalent to 0.400 g of $Pb(NO_3)_2$ in *water R* and dilute to 250.0 mL with the same solvent.

Lead standard solution (0.1 per cent Pb) R1. *5005400.*

Dissolve in *dilute lead-free nitric acid R* a quantity of *lead nitrate R* equivalent to 0.400 g of Pb $(NO_3)_2$ and dilute to 250.0 mL with the same solvent.

Lead standard solution (100 ppm Pb). *5001701.*

Immediately before use, dilute *lead standard solution (0.1 per cent Pb) R* to 10 times its volume with *water R*.

Lead standard solution (10 ppm Pb). *5001702.*

Immediately before use, dilute *lead standard solution (100 ppm Pb) R* to 10 times its volume with *water R*.

Lead standard solution (10 ppm Pb) R1. *5001706.*

Immediately before use, dilute with *water R* to 10 times its volume a solution containing 0.160 g of *lead nitrate R* in 100 mL of *water R*, to which is added 1 mL of *lead-free nitric acid R* and dilute to 1000.0 mL.

Lead standard solution (10 ppm Pb) R2. *5005401.*

Dilute *lead standard solution (0.1 per cent Pb) R1* to 100 times its volume with *dilute lead-free nitric acid R*. Use within 1 week.

Lead standard solution (2 ppm Pb). *5001703.*

Immediately before use, dilute *lead standard solution (10 ppm Pb) R* to 5 times its volume with *water R*.

Lead standard solution (1 ppm Pb). *5001704.*

Immediately before use, dilute *lead standard solution (10 ppm Pb) R* to 10 times its volume with *water R*.

Lead standard solution (0.5 ppm Pb). *5005402.*

Dilute *lead standard solution (10 ppm Pb) R2* to 20 times its volume with *dilute lead-free nitric acid R*. Use within 1 day.

Lead standard solution (0.25 ppm Pb). *5006000.*

Immediately before use, dilute *lead standard solution (1 ppm Pb) R* to 4 times its volume with *water R*.

Lead standard solution (0.1 ppm Pb). *5001705.*

Immediately before use, dilute *lead standard solution (1 ppm Pb) R* to 10 times its volume with *water R*.

Magnesium standard solution (0.1 per cent Mg). *5001803.*

Dissolve *magnesium sulfate R* equivalent to 1.010 g of $MgSO_4,7H_2O$ in *distilled water R* and dilute to 100.0 mL with the same solvent.

Magnesium standard solution (1000 ppm Mg). *5006200.*

Dissolve 5.275 g of *magnesium nitrate R* in 16 mL of *dilute nitric acid R* and dilute to 500.0 mL with *water R*.

Standardisation: carry out the determination of magnesium by complexometry (*2.5.11*).

Magnesium standard solution (100 ppm Mg). *5001800.*

Immediately before use, dilute with *water R* to 10 times its volume a solution containing *magnesium sulfate R* equivalent to 1.010 g of $MgSO_4,7H_2O$ in 100.0 mL.

Magnesium standard solution (10 ppm Mg). *5001801.*

Immediately before use, dilute *magnesium standard solution (100 ppm Mg) R* to 10 times its volume with *water R*.

Magnesium standard solution (10 ppm Mg) R1. *5001802.*

Immediately before use, dilute with *water R* to 100 times its volume a solution containing 8.365 g of *magnesium chloride R* in 1000.0 mL of *dilute hydrochloric acid R*.

Manganese standard solution (1000 ppm Mn). *5005800.*

Dissolve *manganese sulfate R* equivalent to 3.08 g of $MnSO_4,H_2O$ in 500 mL of *1 M nitric acid* and dilute the solution to 1000 mL with *water R*.

Manganese standard solution (100 ppm Mn). *5004500.*

Dissolve *manganese sulfate R* equivalent to 0.308 g of $MnSO_4,H_2O$ in 500 mL of *1M nitric acid* and dilute the clear solution to 1000 mL with *water R*.

Mercury standard solution (1000 ppm Hg). *5001900.*

Dissolve *mercuric chloride R* equivalent to 1.354 g of $HgCl_2$ in 50 mL of *dilute nitric acid R* and dilute to 1000.0 mL with *water R*.

Mercury standard solution (10 ppm Hg). *5001901.*

Immediately before use, dilute with water to 100 times its volume a solution containing *mercuric chloride R* equivalent to 0.338 g of $HgCl_2$ in 250.0 mL.

Nickel liposoluble standard solution (1000 ppm Ni). *5004900.*

A nickel (metal) organic compound in an oil.

Nickel standard solution (10 ppm Ni). *5002000.*

Immediately before use, dilute with *water R* to 100 times its volume a solution containing *nickel sulfate R* equivalent to 4.78 g of $NiSO_4,7H_2O$ in 1000.0 mL.

Nickel standard solution (5 ppm Ni). *5005900.*

Immediately before use dilute *nickel standard solution (10 ppm Ni) R* to twice its volume with *water for chromatography R*.

Nickel standard solution (0.2 ppm Ni). *5002002.*

Immediately before use, dilute *nickel standard solution (10 ppm Ni) R* to 50 times its volume with *water R*.

Nickel standard solution (0.1 ppm Ni). *5002001.*

Immediately before use, dilute *nickel standard solution (10 ppm Ni) R* to 100 times its volume with *water R*.

Nitrate standard solution (100 ppm NO_3). *5002100.*

Immediately before use, dilute with *water R* to 10 times its volume a solution containing *potassium nitrate R* equivalent to 0.815 g of KNO_3 in 500.0 mL.

Nitrate standard solution (10 ppm NO_3). *5002101.*

Immediately before use, dilute *nitrate standard solution (100 ppm NO_3) R* to 10 times its volume with *water R*.

Nitrate standard solution (2 ppm NO_3). *5002102.*

Immediately before use, dilute *nitrate standard solution (10 ppm NO_3) R* to 5 times its volume with *water R*.

Palladium standard solution (500 ppm Pd). *5003600.*

Dissolve 50.0 mg of *palladium R* in 9 mL of *hydrochloric acid R* and dilute to 100.0 mL with *water R*.

Palladium standard solution (20 ppm Pd). *5003602.*

Dissolve 0.333 g of *palladium chloride R* in 2 mL of warm *hydrochloric acid R*. Dilute the solution to 1000.0 mL with a mixture of equal volumes of *dilute hydrochloric acid R* and *water R*. Immediately before use dilute to 10 times its volume with *water R*.

Palladium standard solution (0.5 ppm Pd). *5003601.*

Dilute 1 mL of *palladium standard solution (500 ppm Pd) R* to 1000 mL with a mixture of 0.3 volumes of *nitric acid R* and 99.7 volumes of *water R*.

Phosphate standard solution (200 ppm PO_4). *5004200.*

Dissolve *potassium dihydrogen phosphate R* equivalent to 0.286 g of KH_2PO_4 in *water R* and dilute to 1000.0 mL with the same solvent.

Phosphate standard solution (5 ppm PO_4). *5002200.*

Immediately before use, dilute with *water R* to 100 times its volume a solution containing *potassium dihydrogen phosphate R* equivalent to 0.716 g of KH_2PO_4 in 1000.0 mL.

Platinum standard solution (30 ppm Pt). *5002300.*

Immediately before use, dilute with *1 M hydrochloric acid* to 10 times its volume a solution containing 80 mg of *chloroplatinic acid R* in 100.0 mL of *1 M hydrochloric acid*.

Potassium standard solution (0.2 per cent K). *5002402.*

Dissolve *dipotassium sulfate R* equivalent to 0.446 g of K_2SO_4 in *distilled water R* and dilute to 100.0 mL with the same solvent.

Potassium standard solution (600 ppm K). *5005100.*

Immediately before use, dilute with *water R* to 20 times its volume a solution containing *dipotassium sulfate R* equivalent to 2.676 g of K_2SO_4 in 100.0 mL.

Potassium standard solution (100 ppm K). *5002400.*

Immediately before use, dilute with *water R* to 20 times its volume a solution containing *dipotassium sulfate R* equivalent to 0.446 g of K_2SO_4 in 100.0 mL.

Potassium standard solution (20 ppm K). *5002401.*

Immediately before use, dilute *potassium standard solution (100 ppm K) R* to 5 times its volume with *water R*.

Selenium standard solution (100 ppm Se). *5002500.*

Dissolve 0.100 g of *selenium R* in 2 mL of *nitric acid R*. Evaporate to dryness. Take up the residue in 2 mL of *water R* and evaporate to dryness; carry out three times. Dissolve the residue in 50 mL of *dilute hydrochloric acid R* and dilute to 1000.0 mL with the same acid.

Selenium standard solution (1 ppm Se). *5002501.*

Immediately before use, dilute with *water R* to 40 times its volume a solution containing *selenious acid R* equivalent to 6.54 mg of H_2SeO_3 in 100.0 mL.

Silver standard solution (5 ppm Ag). *5002600.*

Immediately before use, dilute with *water R* to 100 times its volume a solution containing *silver nitrate R* equivalent to 0.790 g of $AgNO_3$ in 1000.0 mL.

Sodium standard solution (1000 ppm Na). *5005700.*

Dissolve a quantity of *anhydrous sodium carbonate R* equivalent to 2.305 g of Na_2CO_3 in a mixture of 25 mL of *water R* and 25 mL of *nitric acid R* and dilute to 1000.0 mL with *water R*.

Sodium standard solution (200 ppm Na). *5002700.*

Immediately before use, dilute with *water R* to 10 times its volume a solution containing *sodium chloride R* equivalent to 0.509 g of NaCl in 100.0 mL.

Sodium standard solution (50 ppm Na). *5002701.*

Dilute the *sodium standard solution (200 ppm Na) R* to four times its volume with *water R*.

Strontium standard solution (1.0 per cent Sr). *5003900.*

Cover with *water R*, *strontium carbonate R* equivalent to 1.6849 g of $SrCO_3$. Cautiously add *hydrochloric acid R* until all the solid has dissolved and there is no sign of further effervescence. Dilute to 100.0 mL with *water R*.

Sulfate standard solution (100 ppm SO_4). *5002802.*

Immediately before use, dilute with *distilled water R* to 10 times its volume a solution in *distilled water R* containing *dipotassium sulfate R* equivalent to 0.181 g of K_2SO_4 in 100.0 mL.

Sulfate standard solution (10 ppm SO_4). *5002800.*

Immediately before use, dilute with *distilled water R* to 100 times its volume a solution in *distilled water R* containing *dipotassium sulfate R* equivalent to 0.181 g of K_2SO_4 in 100.0 mL.

Sulfate standard solution (10 ppm SO_4) R1. *5002801.*

Immediately before use, dilute with *ethanol (30 per cent V/V) R* to 100 times its volume a solution containing *dipotassium sulfate R* equivalent to 0.181 g of K_2SO_4 in 100.0 mL of *ethanol (30 per cent V/V) R*.

Sulfite standard solution (80 ppm SO_2). *5005500.*

Dissolve 3.150 g of *anhydrous sodium sulfite R* in freshly prepared *distilled water R* and dilute to 100.0 mL with the same solvent. Dilute 0.5 mL to 100.0 mL with freshly prepared *distilled water R*.

Sulfite standard solution (1.5 ppm SO_2). *5002900.*

Dissolve *sodium metabisulfite R* equivalent to 0.152 g of $Na_2S_2O_5$ in *water R* and dilute to 100.0 mL with the same solvent. Dilute 5.0 mL of this solution to 100.0 mL with *water R*. To 3.0 mL of the resulting solution, add 4.0 mL of *0.1 M sodium hydroxide* and dilute to 100.0 mL with *water R*.

Thallium standard solution (10 ppm Tl). *5003000.*

Dissolve *thallous sulfate R* equivalent to 0.1235 g of Tl_2SO_4 in a 9 g/L solution of *sodium chloride R* and dilute to 1000.0 mL with the same solution. Dilute 10.0 mL of the solution to 100.0 mL with the 9 g/L solution of *sodium chloride R*.

Tin liposoluble standard solution (1000 ppm Sn). *5005000.*

A tin (metal) organic compound in an oil.

Tin standard solution (5 ppm Sn). *5003100.*

Dissolve *tin R* equivalent to 0.500 g of Sn in a mixture of 5 mL of *water R* and 25 mL of *hydrochloric acid R* and dilute to 1000.0 mL with *water R*. Dilute the solution to 100 times its volume with a 2.5 per cent *V/V* solution of *hydrochloric acid R* immediately before use.

Tin standard solution (0.1 ppm Sn). *5003101.*

Immediately before use, dilute *tin standard solution (5 ppm Sn) R* to 50 times its volume with *water R*.

Titanium standard solution (100 ppm Ti). *5003200.*

Dissolve 100.0 mg of *titanium R* in 100 mL of *hydrochloric acid R* diluted to 150 mL with *water R*, heating if necessary. Allow to cool and dilute to 1000 mL with *water R*.

Vanadium standard solution (1 g/L V). *5003300.*

Dissolve in *water R ammonium vanadate R* equivalent to 0.230 g of NH_4VO_3 and dilute to 100.0 mL with the same solvent.

Zinc standard solution (5 mg/mL Zn). *5003400.*

Dissolve 3.15 g of *zinc oxide R* in 15 mL of *hydrochloric acid R* and dilute to 500.0 mL with *water R*.

Zinc standard solution (100 ppm Zn). *5003401.*

Immediately before use, dilute with *water R* to 10 times its volume a solution containing *zinc sulfate R* equivalent to 0.440 g of $ZnSO_4,7H_2O$ and 1 mL of *acetic acid R* in 100.0 mL.

Zinc standard solution (10 ppm Zn). *5003402.*

Immediately before use, dilute *zinc standard solution (100 ppm Zn) R* to 10 times its volume with *water R*.

Zinc standard solution (5 ppm Zn). *5003403.*

Immediately before use, dilute *zinc standard solution (100 ppm Zn) R* to 20 times its volume with *water R*.

Zirconium standard solution (1 g/L Zr). *5003500.*

Dissolve *zirconyl nitrate R* equivalent to 0.293 g of $ZrO(NO_3)_2,2H_2O$ in a mixture of 2 volumes of *hydrochloric acid R* and 8 volumes of *water R* and dilute to 100.0 mL with the same mixture of solvents.

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4.1.3. BUFFER SOLUTIONS

Buffered acetone solution. *4000100.*

Dissolve 8.15 g of *sodium acetate R* and 42 g of *sodium chloride R* in *water R*, add 68 mL of *0.1 M hydrochloric acid* and 150 mL of *acetone R* and dilute to 500 mL with *water R*.

Buffer solution pH 2.0. *4000200.*

Dissolve 6.57 g of *potassium chloride R* in *water R* and add 119.0 mL of *0.1 M hydrochloric acid*. Dilute to 1000.0 mL with *water R*.

Phosphate buffer solution pH 2.0. *4007900.*

Dissolve 8.95 g of *disodium hydrogen phosphate R* and 3.40 g of *potassium dihydrogen phosphate R* in *water R* and dilute to 1000.0 mL with the same solvent. If necessary adjust the pH with *phosphoric acid R*.

Sulfate buffer solution pH 2.0. *4008900.*

Dissolve 132.1 g of *ammonium sulfate R* in *water R* and dilute to 500.0 mL with the same solvent (Solution A). Carefully and with constant cooling stir 14 mL of sulfuric acid R into about 400 mL of *water R*; allow to cool and dilute to 500.0 mL with *water R* (Solution B). Mix equal volumes of solutions A and B. Adjust the pH if necessary.

Buffer solution pH 2.2. *4010500.*

Mix 6.7 mL of *phosphoric acid R* with 55.0 mL of a 40 g/L solution of *sodium hydroxide R* and dilute to 1000.0 mL with *water R*.

Buffer solution pH 2.5. *4000300.*

Dissolve 100 g of *potassium dihydrogen phosphate R* in 800 mL of *water R*; adjust to pH 2.5 with *hydrochloric acid R* and dilute to 1000.0 mL with *water R*.

Buffer solution pH 2.5 R1. *4000400.*

To 4.9 g of *dilute phosphoric acid R* add 250 mL of *water R*. Adjust the pH with *dilute sodium hydroxide solution R* and dilute to 500.0 mL with *water R*.

Phosphate buffer solution pH 2.8. *4010600.*

Dissolve 7.8 g of *sodium dihydrogen phosphate R* in 900 mL of *water R*, adjust to pH 2.8 with *phosphoric acid R* and dilute to 1000 mL with the same solvent.

Buffer solution pH 3.0. *4008000.*

Dissolve 21.0 g of *citric acid R* in 200 mL of *1 M sodium hydroxide* and dilute to 1000 mL with *water R*. Dilute 40.3 mL of this solution to 100.0 mL with *0.1 M hydrochloric acid*.

0.25 M Citrate buffer solution pH 3.0. *4012600.*

Dissolve 4.8 g of *citric acid R* in 80 mL of *water R*. Adjust the pH with *1 M sodium hydroxide* and dilute to 100.0 mL with *water R*.

0.1 M Phosphate buffer solution pH 3.0. *4011500.*

Dissolve 12.0 g of *anhydrous sodium dihydrogen phosphate R* in *water R*, adjust the pH with *dilute phosphoric acid R1* and dilute to 1000 mL with *water R*.

Phosphate buffer solution pH 3.0. *4000500.*

Mix 0.7 mL of *phosphoric acid R* with 100 mL of *water R*. Dilute to 900 mL with the same solvent. Adjust to pH 3.0 with *strong sodium hydroxide solution R* and dilute to 1000 mL with *water R*.

Phosphate buffer solution pH 3.0 R1. *4010000.*

Dissolve 3.40 g of *potassium dihydrogen phosphate R* in 900 mL of *water R*. Adjust to pH 3.0 with *phosphoric acid R* and dilute to 1000.0 mL with *water R*.

Phosphate buffer solution pH 3.2. *4008100.*

To 900 mL of a 4 g/L solution of *sodium dihydrogen phosphate R*, add 100 mL of a 2.5 g/L solution of *phosphoric acid R*. Adjust the pH if necessary.

Phosphate buffer solution pH 3.2 R1. *4008500.*

Adjust a 35.8 g/L solution of *disodium hydrogen phosphate R* to pH 3.2 with *dilute phosphoric acid R*. Dilute 100.0 mL of the solution to 2000.0 mL with *water R*.

Buffer solution pH 3.5. *4000600.*

Dissolve 25.0 g of *ammonium acetate R* in 25 mL of *water R* and add 38.0 mL of *hydrochloric acid R1*. Adjust the pH if necessary with *dilute hydrochloric acid R* or *dilute ammonia R1*. Dilute to 100.0 mL with *water R*.

Phosphate buffer solution pH 3.5. *4000700.*

Dissolve 68.0 g of *potassium dihydrogen phosphate R* in *water R* and dilute to 1000.0 mL with the same solvent. Adjust the pH with *phosphoric acid R*.

Buffer solution pH 3.6. *4000800.*

To 250.0 mL of *0.2 M potassium hydrogen phthalate R* add 11.94 mL of *0.2 M hydrochloric acid*. Dilute to 1000.0 mL with *water R*.

Buffer solution pH 3.7. *4000900.*

To 15.0 mL of *acetic acid R* add 60 mL of *ethanol (96 per cent) R* and 20 mL of *water R*. Adjust to pH 3.7 by the addition of *ammonia R*. Dilute to 100.0 mL with *water R*.

Buffered copper sulfate solution pH 4.0. *4001000.*

Dissolve 0.25 g of *copper sulfate R* and 4.5 g of *ammonium acetate R* in *dilute acetic acid R* and dilute to 100.0 mL with the same solvent.

Sodium acetate buffer solution pH 4.0 (0.1 M). *4013800.*

Dissolve 822 mg of *sodium acetate R* in 100 mL of *water R* (solution A). Dilute 1.44 mL of *glacial acetic acid R* in 250 mL of *water R* (solution B). Titrate 100 mL of solution B using about 20 mL of solution A.

Acetate buffer solution pH 4.4. *4001100.*

Dissolve 136 g of *sodium acetate R* and 77 g of *ammonium acetate R* in *water R* and dilute to 1000.0 mL with the same solvent; add 250.0 mL of *glacial acetic acid R* and mix.

Phthalate buffer solution pH 4.4. *4001200.*

Dissolve 2.042 g of *potassium hydrogen phthalate R* in 50 mL of *water R*, add 7.5 mL of *0.2 M sodium hydroxide* and dilute to 200.0 mL with *water R*.

Acetate buffer solution pH 4.5. *4012500.*

Dissolve 77.1 g of *ammonium acetate R* in *water R*. Add 70 mL of *glacial acetic acid R* and dilute to 1000.0 mL with *water R*.

0.05 M Phosphate buffer solution pH 4.5. *4009000.*

Dissolve 6.80 g of *potassium dihydrogen phosphate R* in 1000.0 mL of *water R*. The pH (*2.2.3*) of the solution is 4.5.

Sodium acetate buffer solution pH 4.5. *4010100.*

Dissolve 63 g of *anhydrous sodium acetate R* in *water R*, add 90 mL *acetic acid R* and adjust to pH 4.5, and dilute to 1000 mL with *water R*.

Acetate buffer solution pH 4.6. *4001400.*

Dissolve 5.4 g of *sodium acetate R* in 50 mL of *water R*, add 2.4 g of *glacial acetic acid R* and dilute to 100.0 mL with *water R*. Adjust the pH if necessary.